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# OIL NUMBER FOR CALIFORNIA

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THE CALIFORNIA PROMOTION COMMITTEE

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THE CALIFORNIA PROMOTION COMMITTEE

(THE STATE CENTRAL ORGANIZATION)

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1906

January . . . . . Educational Number

# FOR CALIFORNIA

A MONTHLY PUBLICATION

"FOR THOSE WHO DESIRE THE BEST THERE IS IN LIFE."

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## OIL NUMBER

DECEMBER, 1905.

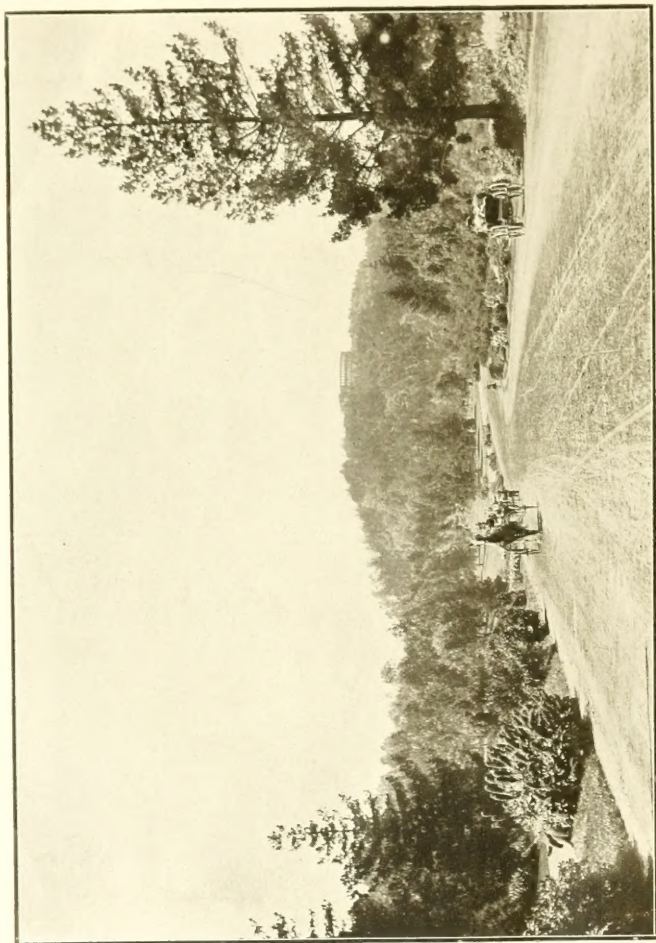
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THE CALIFORNIA PROMOTION COMMITTEE

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OILED DRIVEWAY, GOLDEN GATE PARK.



# THE OIL INDUSTRY.

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**M**ILLIONS of dollars are expended every year in the development of the oil industry in California. It has grown from a question of venture to a fixed and stable business enterprise, and to-day there is no more important industry in the State. In the present number of "For California," devoted to the oil industry, the California Promotion Committee has called upon the men in the State who are best posted on the various branches of the industry, and their responses have been prompt and satisfying.

L. P. Crane, of Alameda County, President of the Pacific Coast Petroleum Miners' Association, gives a most interesting and instructive article on the history of petroleum, showing that the beginning of this industry was so far back in the annals of time as to preclude the possibility of knowing when it was first used.

The Use of Petroleum and its Products for Production of Power is the title of a most conclusive and able article from the pen of John H. Hoppes, who is a recognized authority on this subject.

The manufacture and use of asphaltum is written about by John Baker, Jr., who is known as a careful student and close observer.

A. M. Hunt writes of petroleum as a fuel on locomotives and steamships, and shows clearly and entertainingly the advances made by the use of this new fuel on the California coast. He shows the relative merits and cost of the fuel as compared with coal, and gives some figures that will attract attention.

Dr. C. T. Deane, Secretary of the Pacific Coast Petroleum Miners' Association, covers the oil industry in the State in a most comprehensive and complete article, showing deep research and close thought to the subject matter. Dr. Deane's article is one well worthy of preservation for its conciseness and clearness of statement.

Charles G. Yale, than whom there is no better authority on the mines and their products of California, has a most complete article covering the production of oil in the State since its earliest discovery. This article is reinforced by a series of tables whose value will strike the reader at a glance, as they show conclusively and effectively the production of oils in all the counties with the values of the product.

Taken as a whole the present number of "For California" is one that will be well worthy of preservation for future reference, and for the investor or manufacturer it contains much that will assist in the advancement of all business. The subjects covered in the articles are those of most importance in California, and they have been covered in a manner that gives the most information in the least space. Owing to the lack of space an article on making good roads by the use of petroleum was crowded out. The making of roads in California is an industry that is now attracting the attention of all the officials who have the subject in charge, and the oil of California is recognized as being the best in the world for this purpose. The natural asphaltum base of the crude oil makes a road that cannot be improved upon even by the use of the famous Trinidad asphaltum.

This fact has now become so well recognized that in nearly all of the counties of the State roads are being made with petroleum, and the result is that it will not be many years until this will be practically a dustless State.

The Promotion Committee feels, in presenting the present number of "For California," that it is furnishing an epitome of one of the great industries which will soon place California in the first rank as a producer and manufacturing State in the world. With the coming of cheap fuel through the development of oil wells, California can do better than any other State because of the fact that we have here all the raw products necessary for a perfect manufacturing State.

# EARLY AND LATER HISTORY OF PETROLEUM.

By L. P. CRANE, President Pacific Coast Petroleum Miners' Association

**W**HILE the history of petroleum in America prior to developments brought about by artesian boring will probably be accounted of little practical value, yet to the man of commercial insight it is a pivot point at which begins a new era in the world's manufacturing industries.

In Europe and Asia it has been an object of some commercial value for centuries, and there is good reason to believe that it has been known and used since the earliest ages of the world.

It is impossible to go back to the time when petroleum was first discovered. From its frequent occurrence in the form of springs in many parts of the world, it is evident that it has always been known—certainly more than four thousand years.

Layard and Botta, in their discoveries at Nineveh, adduce positive evidence that the inhabitants of this ancient city had knowledge of the existence and use of petroleum. In building the city, an asphaltic mortar ("slime" according to the Old Testament) was employed, the asphalt for which was partially evaporated petroleum. That used at Babylon was obtained from the Springs of Is, on the Euphrates, which, at a later date, attracted the attention of Alexander, of Trajan, and of Julian; they, even to this day, supply the neighboring villages with oil.

Herodotus, 500 years before Christ, spoke of the oil wells of Zante; and Pliny and Dioscorides described the oil of Agrigentum, which was used in lamps under the name of "Sicilian Oil."

The wells of Amiano, on the banks of the Taro, were formerly used for lighting the City of Genoa.

There is reason to believe that at some former period in the history of the American continent, the existence and uses of petroleum had been better understood than they were for some centuries before the recent artesian developments. The numerous pits, until recently, and perhaps even still to be seen along the valley of Oil Creek, cribbed with roughly hewn timber, but nearly hidden by the rubbish of ages, indicate a development comparatively extensive. Trees were found growing in the center of some of these pits, which, we are told, on the evidence of the concentric circles in the wood, were shown to be the growth of centuries. Many circumstances concur in referring these excavations to a period of time, and to a race of people, who occupied the country prior to the advent of those aborigines, found here by our Latin or Saxon ancestors. They were probably the work of that mysterious people who left the traces of their rude civilization in the copper mines about Lake Superior and the mounds of the Southwest.

When we consider how easily, partially nomadic races, of which they probably were, degenerate, and how suddenly they are sometimes extinguished, this disposition of the matter seems plausible; but as all that is more within the sphere of the archaeologist than the historian of a modern industry, we have passed it without research.

Petroleum and electricity will revolutionize the vast territory west of the Mississippi River, where the future people of America will plant the great industries of the twentieth century. Connecting the Pacific Coast with the Orient where 500,000,000 people are being modernized, and made acquainted with the Saxon's methods of scientific productions.

The percentage of oil carried in the sands of the Coalinga Field, as shown by tests made by the Pacific Coast Petroleum Miners' Association in 1904 and 1905, prove that from property in Section 31 the results would be as follows per acre:



Oil sand 100 feet thick, at 20 per cent saturation, 155,400 barrels.  
Oil sand 200 feet thick, at 20 per cent saturation, 310,800 barrels.  
Oil sand 300 feet thick, at 20 per cent saturation, 466,200 barrels.  
Oil sand 400 feet thick, at 20 per cent saturation, 621,600 barrels.  
Oil sand 500 feet thick at 20 per cent saturation, 777,000 barrels.  
Oil sand 600 feet thick, at 20 per cent saturation, 932,400 barrels.

This is estimating that all the oil should be extracted from the sand. The experience of the leading experts show that fully 90 per cent has been successfully taken out of the oil sands of California where the wells have been exhausted. Where the oil measures have been carefully kept in the boring of the wells, there can be but little error in the calculations. From these statistics the value of the oil field can be estimated closely. By these statistics obtained by much care and close calculation, forty acres of oil land with an oil sand of 400 feet would contain 24,640,000 barrels of oil, and if the saturation is greater than 20 per cent, as in many cases, the product would be correspondingly greater.

There has been but little known about the real value of the oil fields of California, and when one considers the future of the manufacturing industry on the Pacific Coast, and the demands that will be made upon the oil fields for crude petroleum for fuel for the merchant marine, that will carry on the commerce of the Pacific, one may begin to estimate the value of petroleum as a fuel, leaving out the demand for refined oil. Twenty thousand locomotives in the United States are being changed from coal to oil burners. The onward march of the American nation toward the Pacific Coast means increased demand for fuel, and he who does not see it is blind to the evolution of the age.

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## USE OF PETROLEUM AND PRODUCTS FOR PRODUCTION OF POWER.

By JOHN H. HOPPS

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**N**O one factor contributes so much to the development of a country where labor is scarce and highly paid as cheap power. Ever since the invention of the steam engine, the efforts of engineers have been directed toward the securing of an increase in efficiency of the prime movers, the object being a reduction in the cost of power.

The cost of power depends primarily on the cost of fuel, and the influence of the practically unlimited supply of petroleum on the industrial development of California will be to foster manufacturing enterprises, its influence in this direction being clearly noticeable.

Petroleum and its products are used as fuel for the production of power in two ways: First—By utilizing the heat generated by the combustion of the fuel to produce steam in a boiler for use in a steam engine; Second—By the combustion of the fuel either as a gas or an oil vapor in the cylinder of a gas or gasoline engine.

The obvious advantages of liquid fuel for the production of steam power are briefly: First—Low cost and high efficiency; Second—Increased capacity of boilers; Third—Ease of transportation; Fourth—Reduction of storage bulk; Fifth—Ease and rapidity with which oil fires can be regulated; Sixth—Saving of labor; Seventh—Cleanliness; with liquid fuel there is no smoke.

Crude petroleum can now be contracted for delivered in San Francisco for forty-five cents per barrel. A barrel of oil of fifteen degrees gravity (Beaume) weighs 337 pounds, making the cost of oil per pound 0.1336 cents. Coal at \$5.00 per long ton costs 0.223 cents per pound.

One pound of average fuel oil will generate sufficient heat to turn into steam from 12 to 15 pounds of water from and at a temperature of 212 degrees F., depending on the efficiency of the boiler.



One pound of good Coast coal (Comox or Wellington) will turn into steam from 8 to 9 pounds of water from and at a temperature of 212 degrees F.

The cost of fuel then, per pound of water evaporated, will be: Petroleum, 0.0099 cents; coal, 0.026 cents; showing that coal at \$5.00 per ton costs, as fuel, 2.6-10 times as much as oil at 45 cents per barrel; or, in other words, the cost of good coal must be reduced to \$1.92 per ton to compete with oil at 45 cents per barrel.

It is generally admitted in practice that four barrels of oil are the equivalent of one ton of coal under average conditions. This would make the equivalent cost of coal to oil at 45 cents per barrel \$1.80 per ton.

The steaming capacity of boilers is considerably increased by using liquid fuel. Opinions differ as to the actual increase in capacity, claims having been made that from 25 to 50 per cent more steam could be produced by a given boiler with oil as fuel than could be produced with coal.

The greatest advantages in the use of petroleum as fuel, aside from the low cost, are found in the saving of labor in firing, cleaning fires, cleaning boilers and handling coal and ashes—in large plants the difference amounting to very considerable sums. Again, the saving of storage space is of great importance, as a given supply of oil fuel can be stored in half the space occupied by a corresponding amount of coal. Further, liquid fuel may be stored in tanks remote from the boilers and placed below the ground, whilst coal must be so placed as to be easily reached from the boiler room floor.

For the production of power on board ship, petroleum has all the advantages enumerated above, and is in many respects an ideal fuel. Aside from its low cost, the advantages derived from ease of handling and small storage bulk cannot be overrated. Not only does petroleum occupy only half the space required for coal, but it can be carried in parts of the ship not otherwise useful. The consequent increased cargo space means increased earning power for the ship. The saving in time is also a very important matter. Where formerly from one to three days' time was required to coal a ship, necessitating moving to the coal bunkers and a delay in loading cargo, the necessary oil fuel is now pumped into the ship from a barge in a few hours without interfering with the handling of cargo, and consequently without loss of time. In addition, the objectionable coal dust and dirt incident to coaling is entirely done away with.

In a small coasting steamer fitted to burn oil fuel about three years ago, careful records have been kept of the fuel cost, both with coal and oil. The cost for fuel averaged for a period of six months in each case was: Coal at \$5.25 per ton, \$2.65 per hour; petroleum at 70 cents per barrel, \$1.64 per hour.

Petroleum is now being used as fuel on locomotives generally throughout the States. On the Great Eastern Railway, England, the average consumption of fuel in express locomotives is stated to be: Using coal, 35.4 pounds per mile; using oil, 16.5 pounds per mile.

Next to lower cost of fuel, the greatest advantages in using oil for locomotives are undoubtedly the ease and rapidity with which fires can be regulated, and the absence of sparks, which frequently cause extensive fires along the route.

As stated above, the internal combustion engine is attracting much attention and is coming into very general use. These engines are of two types: The gas engine proper, and the gasoline or oil engine. When a simple and efficient gas producer capable of making a fixed gas from petroleum at a moderate cost has been invented, there is no doubt that the gas engine will to a great extent displace the steam engine.

In California the gasoline or oil engine is in general use, the fuel being gasoline or distillates of various kinds, produced in the process of refining crude petroleum. For localities where fuel is expensive and water scarce, and for the user of small amounts of power, the gasoline engine is very desirable. By equipping the gasoline engine with a generator to heat the liquid fuel, it is possible to use Coalinga oil and less expensive

distillates. These distillates can be purchased for five cents per gallon at this time. An efficient gasoline engine will develop one horse power on from one-eighth to one-tenth of a gallon of distillates per hour, depending on the quality of distillates and efficiency of the engine, making the fuel cost per horse power per hour from 0.5 to 0.625 cents.

## THE OIL INDUSTRY

By DR. C. T. DEANE, Secretary Pacific Coast Petroleum Traders' Association

**I**N treating of the oil industry of California I shall confine myself to facts, and all figures will be most conservative.

While we have known of the existence of petroleum for the past twenty-five years, only for five years has its importance been appreciated, and even now there are many who smile when you tell them of the great changes the use of crude oil is bound to produce in the future.

Development work has determined the existence of a well-defined oil belt, extending from Siskiyou to San Diego.

There is nothing to prevent us from entering into manufacturing competition with the Atlantic and trans-Mississippi States, for oil at less than \$1 a barrel is as cheap as coal at \$3 a ton; and then our climate, particularly around the Bay of San Francisco, is capable of bringing forth the best efforts of the mechanic.

The Southern Pacific and Santa Fe railroads use oil exclusively in their locomotives and machine shops. A locomotive uses about 23 barrels of oil a day; it is estimated that the Southern Pacific Railroad thus saves over \$5,000,000 per annum.

The increasing production of oil during the last five years has been from 1900, 4,000,000 barrels; 1904, 29,000,000 barrels; 1905, estimated, 35,000,000 barrels.

California produces more oil than any other State in the Union.

The producing fields of California are, beginning at the Southern end of the State, as follows: Fullerton, Puente, Whittier, Los Angeles, Newhall, Ventura, Summerland, Maria, Kern River, Sunset and Midway, McKittrick, Coalinga; Santa Clara and San Mateo Counties.

None of these fields have been brought into full production. The greatest oil field yet developed in California and what may prove the most prolific district in the world, with, perhaps, the exception of Baku (Russia), is the Kern River; here we have over 4000 acres of proven land, capable of developing on any acre a well of not less than 100 barrels a day; at the present there are over 600 wells pumping, which produced in 1904 over 17,000,000 barrels of oil. Kern River has already produced over 65,000,000 barrels and is producing 40,000 barrels a day.

There are in the State at the present about 3,000 wells. The consumer in San Francisco is paying now about 65 to 70 cents a barrel.

At the beginning of this year there were forty refineries in the State, making kerosene, distillate, lubricants, asphaltum, coke and many by-products; the great refinery at Point Richmond on the Bay of San Francisco, constructed by the Standard Oil Company, in connection with its pipe line, 278 miles long from Bakersfield and a branch to Coalinga, is one of the largest in the United States, having a capacity of handling over 10,000 barrels of oil a day.

It was believed that California oil, with an asphaltum base, could not be refined for kerosene at a profit, but the ghost of that fallacy has been laid to rest, and most of the kerosene used on the Pacific Coast to-day is made not twenty miles from the city of San Francisco, instead of importing it from the Atlantic States.

There is rapidly developing a large demand for oil in the sprinkling of roads; an oil road is so much smoother, more durable, cleaner and less



costly, that the Boards of Supervisors throughout the State are gradually learning. It takes about 150 barrels of oil to oil a mile of road (the oil has to be heated to get the best results), and it costs less than \$200 per mile.

Nearly all the gas companies in California are now using oil in the manufacture of that illuminant; there is in the neighborhood of 20,000,000 feet of gas used a day. These consume nearly 2,000,000 barrels of oil; the gas made from oil is so superior to coal gas that there is no question but that this demand will largely increase. Oil gas can be put into the holder for less than 20 cents a 1,000 feet.

Another important product of the refineries is the production of asphalt from crude oil; this asphaltum contains 99 per cent bitumen and is absolutely impervious to water, consequently asphalt refined from oil is pure, while that imported is a natural product, not a true asphalt at all, but a bituminous rock, filled with foreign substances, which are soluble in water, therefore easily destroyed by rains.

To give some idea of the increased production of this refined asphalt it will only be necessary to give the following figures: In 1898 the output was 12,000 tons, while last year, 1904, it had increased to 60,000 tons; of this last figure 90 per cent was exported to the Atlantic States and to Europe.

Another point in favor of California asphalt is its uniform standard, while that imported from Trinidad is variable and unreliable. Where the two come into honest competition, ours always wins. A satisfactory pavement can be laid at \$1.50 a square yard. The railroads have recently reduced the freight on California asphalt to the Atlantic Coast to \$10 a ton, hoping thereby to encourage its use beyond the borders of the State. Every 50 cents taken from this price will increase the consumption.

The amount of asphalt required for paving purposes alone in the United States aggregates over 200,000 tons per annum. There are so many uses for this valuable by-product of our oil wells, both in building, roofing (which, strange to say, is almost fire-proof), laying the floors of cellars, etc., etc., that a large amount of our oil production will be absorbed in this way. It takes about 20 barrels of oil to produce one ton of refined asphalt.

There have been paid by oil companies in the Kern River field alone in the past three years over \$2,000,000, and this does not include any profit made by the "Associated Oil Company," a great corporation with a capital of \$40,000,000, which owns more than half the best lands in the district. This company has a large number of wells now pumping and producing over 15,000 barrels of oil a day. They have recently purchased a pipe line and steamers from Coalinga to Monterey Bay, and have expended on betterments over \$7,000,000. Another very large and prosperous company is the Union Oil Company of California. This company has a large acreage in almost every oil field in the State, besides refineries, tank steamers, etc. The Associated and Union Oil Companies are California companies and their capital is all California capital.

I have mentioned above that oil was a better and cheaper fuel than coal for steam purposes, and the following table will give a concrete object lesson, which will explain itself.

Sixteen tons of 15 degrees gravity oil generates as much steam as 25 tons of the best Welsh coal. The evaporation per pound of coal at 212 degrees is 9 pounds. The evaporation per pound of oil at 212 degrees is 15 pounds, thus 1,362 pounds of oil seem equivalent to 2,040 pounds of coal, which gives a ratio of efficiency of oil to coal of 1.65 to 1. 104 barrels of oil equal 25 tons of coal in heating power. One barrel of oil weighs about 300 pounds; one barrel, 42 gallons. One of the ferry boats uses 143 barrels of oil in 48 hours, formerly the same boat used 40 tons of coal to do the same work; this equals 3 1-2 barrels to a ton of coal, or in money: 40 tons of coal at \$6.00, \$240.00; 143 barrels of oil at 70 cents, \$109.10, saving \$139.90, or over 58 per cent.



The use of oil in marine boilers is rapidly forging ahead. There are 200 vessels with San Francisco as a home port using oil; these vessels average from small tugs and ferry boats to large ocean steamers of 8,000 tons register.

There are many other reasons why steamers should use oil, but when we take into consideration all its advantages, more heat units, cheapness, less space occupied, cleanliness, safety, life of machinery—in fact oil as a fuel has no disadvantages—we wonder that ship owners are not falling over each other in adopting it, instead of the cumbersome (stage coach) coal, dirt, loss of time, loss of money and loss of patience.

If the nineteenth century was the age of coal, the present one will be the age of oil. As a steam producer coal is out of date and it is my belief that inside of five years there will not be a steamer leaving the port of San Francisco using other fuel than oil. If the Bay of San Francisco can float the navies of the world, the oil fields of California can move them.

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## PETROLEUM AS FUEL ON LOCOMOTIVES AND STEAMSHIPS.

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By A. M. HUNT

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**C**ALIFORNIA as a producer of petroleum has advanced to the front rank with giant strides in the past few years, and much of the oil produced being of inferior grade for refining purpose, it has come into extensive use as fuel in power plants.

It has practically displaced coal as fuel in every steam plant of any magnitude in the State, by reason of its relatively low cost, and simplicity, cleanliness and ease of handling.

Its market as fuel in stationary plants has been limited, in a degree, by the large amount of power in use that is developed from the water of the Sierra streams, and with the growing production, it was only a question of time when the railroads and steamship companies would be led to adopt it for fuel.

Relative cost as compared with other fuels is a very large factor in such a case, but an adequate supply of reasonable permanence had also to be assured before the railroad companies were justified in adopting it.

Both the Santa Fe and Southern Pacific Railroad Companies have acquired extensive interests in oil properties, thus assuring themselves of their supply for a number of years, and are now using petroleum fuel almost exclusively on most of their California mileage. Other smaller lines throughout the Central and Southern section of the State are using it exclusively.

There is, of course, a limiting radius, measured from the oil fields, beyond which it is not economical for the railroads to use the petroleum. Incoming coal from outlying fields will at some point meet the outgoing oil where the cost of production and transportation of the two will balance, so establishing the area within which the latter can be economically used.

The use of oil fuel on locomotives has certain incidental advantages worthy of note. Freedom from cinders contributes largely to the comfort of passengers.

Relative absence of flying sparks reduces the hazard of grain fields and forest fires. The handling of ashes is eliminated and the fireman's work rendered infinitely less laborious.

Mr. H. M. Honn, at one time Traveling Fireman of the Southern Pacific Railroad, San Joaquin Division, comments on its use as follows:

"Of course, oil burning in this country is in its infancy, and there is room for a great deal of improvement, but considering the length of time we have been at it, it is certainly remarkable to see how those engines go up the hills with their heavy trains, with plenty of steam, no smoke, no dust, no cinders, and no sweating fireman."

The use of petroleum as fuel on steamships is of great importance from a commercial standpoint, but involves considerations beyond those which are determinative of its adoption in stationary plants and on locomotives.

When a vessel travels over a route where it can obtain fuel oil at both terminals, the storage space required is limited to that required for the trip one way, but if oil can be obtained at only one terminal, she must carry oil for the round trip. The same space cannot be utilized alternately for storage of oil and coal, so the extent to which oil will become the fuel for marine use will be determined, in a great measure, by the ports of call where petroleum is carried in storage.

A great number of the steamers running on San Francisco Bay and its tributaries, and those doing a coastwise business, are using oil fuel with great success. Fuel oil is now kept in storage at Los Angeles, Port Harford, San Francisco, Portland and at points on the Hawaiian Islands.

Relative cost for equal heat values is not the only consideration governing its adoption. The oil for equal heating value occupies only about 50 per cent of the space taken by coal and weighs about 55 per cent as much. Tanks for its storage can be built in spaces not otherwise utilized. For these reasons, an oil-burning steamer has available cargo space and displacement in excess of a coal-burning one, making voyages of equal length between ports at which both fuels can be had.

An additional advantage in favor of the fuel oil lies in the fact that fewer firemen are required, and these work under more favorable conditions as regards comfort.

The steamers now plying on the Yukon River, between St. Michaels and Dawson, are using oil fuel, which is shipped up to that section in ocean going tank steamers from California. This has proven a measure of considerable economy over the old system of using coal and wood.

Relatively few ocean going steamers are at present using this fuel, but it is quite probable that plans now under consideration will be carried out to establish oil storage at a number of points on trade routes, with the certain result that the market for our crude oil can be expanded indefinitely. That our production can be largely expanded is well known to those familiar with the situation, and the promise of the near future is bright indeed.

In connection with the project of reaching out for the world's market, a pipe line is contemplated across the Isthmus of Panama, so that our fuel oil may be made available at Atlantic ports, without the necessity of the long trip around Cape Horn.

The commercial significance of the use of oil for marine power is shown by the fact that there are now running out of San Francisco 189 vessels using oil for fuel, the gross tonnage being 132,391.

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## THE MANUFACTURE AND USES OF ASPHALTUM.

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By JOHN BAKER, Jr.

**T**O the ordinary individual asphaltum is almost an unknown substance; pitch and similar materials are all the same to the common observer. Seeing asphaltum as used on the street, the layman conjures in his mind visions of tremendous chemical action in the bowels of the earth, wherein a vast caldron is used by nature in the creation of asphaltum, which is afterwards brought to the surface by mighty convulsions and volcanic eruptions. Trinidad pitch lake represents to the average person the source of supply of asphaltum for the world.

The extended use of the so-called "natural" asphaltums for various purposes demonstrated years ago the urgent necessity for an asphaltum composed of practically pure bitumen; an asphaltum which might be

tempered to meet the peculiar requirements of special uses; an asphaltum which might be obtained of uniform quality, grade and reliability. An attempt was made to obtain such a material by refining the asphaltum produced by Nature, but the process proved to be so costly that commercially considered it was impracticable.

When the vast oil fields of California were discovered, analysis of the crude oil obtained showed that its base was of a purely asphaltic character. The oils of Pennsylvania and Ohio have a paraffine base, those of Texas both paraffine and asphaltum—in California alone has a pure asphaltic Maltha been taken from the ground. When it had been thoroughly proven that the asphaltic base of the California crude was practically a pure bitumen, carrying no foreign or organic matter, refiners conceived the possibility of recovering by process of distillation the asphaltum in its pure state, and refineries were erected for the purpose in different portions of California. The result was a success hardly contemplated by the pioneers of the industry. The asphaltum obtained by distillation proved to be so far superior to that mined from the earth, that the output has grown to immense proportions in the short period of five years, and is rapidly becoming one of its leading industries. It has, therefore, been proven that Man, by intelligent manipulation, can produce an asphaltum of uniform quality, of any temper desired, of practical purity, of unlimited supply. So far, only the crude oils of California yield this ideal material.

The asphaltum is used for many purposes. Utilized for street paving, it produces practically the ideal street covering—dustless, noiseless, resilient, durable and ornamental. For roofing, it insures absolute imperviousness to water, will withstand weathering, lowers insurance rates, admits of quick economical repair. As a lining for reservoirs, it provides absolute water-tight walls, offers no surface for fungus growth, does not contaminate the water. As a protection for underground pipe it has been found of superior merit. Wooden piles coated with it resist the ravages of the teredo and last many years under the most trying circumstances where their life otherwise would be brief. As a damp course it is possible to obtain a dry cellar in any country, at any season, under an circumstances. It is also used as a base for paints and varnishes, for insulating, for making briquettes, for coating structural steel, for the manufacture of building paper, and a host of other and increasing purposes where practically pure bitumen is required.

The introduction of the pure California asphaltum in the Eastern market and its instant and tremendous success as a paving material, caused consternation in the ranks of the promoters of the so-called "natural" asphaltums. They recognized immediately that if the California product was permitted to compete along legitimate lines and given a fair field, Trinidad asphalt and other impure foreign asphalts would quickly be driven from the market. The result of their efforts for self-preservation was, first, the establishment of high freight rates; second, the subsidizing of high chemical authorities and other experts, who issued pamphlets and literature, setting forth that the new material was not the equal of the so-called "natural" products, was deficient in the qualities necessary to create lasting pavements, finally coining the phrase "residual pitch" as a contemptuous description of California asphaltum. A systematic campaign was later inaugurated in most of the large cities to have it barred from the specifications covering street paving requirements for asphaltic cement, arguments being advanced that the material was too quickly manufactured, that it had no lasting qualities, that it was not possible to produce it of uniform consistency, and finally, that there was no assurance of supply.

However, in spite of vicious misrepresentation, in spite of discriminating freight rates, in spite of distance from the large markets, in spite of unfavorable specification legislation, California asphaltum steadily gained in favor, steadily replaced the impure foreign asphalts, and steadily proved its worth as a paving material wherever tried. As an instance of the wonderful growth of the output, in 1902 the entire production of the State



was only 20,000 short tons; this year up to November 1st, one concern alone has produced and marketed a much greater tonnage than the 1902 output.

Specifications everywhere now admit California asphaltum, and wherever it has been fairly tested it has been established as the standard. Laid side by side with the so-called "natural" asphalts it has repeatedly shown its superiority, being more durable and requiring a less expenditure for maintenance. This season sailing vessels have been chartered, loaded with the material, and sent around the Horn to the Atlantic seaboard. Large shipments have been made to the same destination by steamers, while thousands of tons have gone overland. The material has now been accepted on its merits, and the next few years should show an astonishing building up of this California industry—an industry unique in that California is practically the only part of the world where it may be carried on successfully.

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## CALIFORNIA'S PRODUCTION OF PETROLEUM.

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By CHARLES G. YALE, Statistician California State Mining Bureau

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**I**N view of the fact that others better qualified will doubtless write up descriptions of the various petroleum fields of the State in this issue of "For California," and that all the occurrences will be duly noted, it is intended in what follows to show merely the gradual progress in production, and that in as brief a manner as may be. California has now risen to first place among the other States of the Union in the production of mineral oils, as far as the annual output in number of barrels is concerned, but in total value and average value received per barrel it does not hold that rank unfortunately. The limitations of this article preclude a discussion on the causes of this latter condition.

While gold is still the leading product in point of value in the mineral industry of the State, petroleum is now the second; but gold has been mined here since 1848, and it is only within the past few years that the petroleum interests of the State have been recognized as important. It was not until 1895 that there was over a million barrels of oil produced in any one year. In 1894—the last year of which we have complete data—the output was 29,736,003 barrels, valued at \$8,317,809, as compared with 24,340,839 barrels in 1903 valued at \$7,313,271. This shows an increased output in one year of 5,395,164 barrels, with an increase in value of about a million dollars.

The oil men, however, have still much ahead of them in trying to catch up with the gold miners, because California's output of gold in 1904 was \$19,109,600, which was an increase of about three million dollars over the yield of the previous year. For a long time copper kept second place in the list of producing minerals, but the petroleum yield is now valued at more than double that of the copper mines in this State.

In order to show the gradual progress in the development of the oil industry of California the appended tables have been prepared. In that giving the entire output of the State by years, the figures of the United States Geological Survey have been taken up to 1894, but from that year on, the figures of the California State Mining Bureau. It was not until 1894 that the Bureau began the compilation of annual statistics of mineral output, and it is for this reason that the tables of product for each county are given no further back than eleven years, they being obtained from Mining Bureau records. This is the first time as far as the writer knows that an attempt has been made to segregate the oil production in this State by county over a series of years, and it is hoped that the following tables will be found of service as a matter of reference. The amount accredited to "unapportioned" was so placed to conceal the operations of single companies which

were the only producers in certain counties at the period the figures were compiled.

The tables show in the briefest possible space the record not only of the State as a whole in oil production, but also that of the respective counties named. The effect of locality on price is also made apparent. For example, it will be noted that the Kern County product is over three times that of Los Angeles County in barrels, yet more money was obtained for the product of the latter county in the period specified. Again, Fresno yielded about double what Ventura County did, yet the latter county got the most money out of its product. Further analysis of these figures would extend this article beyond the limits prescribed, and moreover the figures plainly speak for themselves.

#### FRESNO COUNTY.

| Year.     | Barrels.  | Value.      |
|-----------|-----------|-------------|
| 1896 ---- | 14,119    | 56,750      |
| 1897 ---- | 70,140    | 70,840      |
| 1898 ---- | 154,000   | 154,000     |
| 1899 ---- | 439,372   | 439,372     |
| 1900 ---- | 547,960   | 547,960     |
| 1901 ---- | 525,433   | 236,444     |
| 1902 ---- | 571,233   | 199,931     |
| 1903 ---- | 2,214,160 | 730,673     |
| 1904 ---- | 5,114,958 | 1,520,847   |
|           | <hr/>     | <hr/>       |
|           | 9,651,375 | \$3,956,817 |

#### KERN COUNTY.

| Year.    | Barrels.   | Value.    |
|----------|------------|-----------|
| 1894 --- | 11,215     | \$69,334  |
| 1895 --- | 116        | 116       |
| 1896 --- | 235        | 235       |
| 1897 --- | -----      | -----     |
| 1898 --- | 10,000     | 10,000    |
| 1899 --- | 15,000     | 13,500    |
| 1900 --- | 919,275    | 827,348   |
| 1901 --- | 3,902,125  | 1,131,616 |
| 1902 --- | 9,777,948  | 1,955,585 |
| 1903 --- | 18,001,148 | 3,600,230 |
| 1904 --- | 19,608,045 | 3,431,408 |
|          | <hr/>      | <hr/>     |

52,245,107 \$11,039,372

#### LOS ANGELES COUNTY.

| Year.    | Barrels.  | Value.    |
|----------|-----------|-----------|
| 1894 --- | 475,650   | \$617,065 |
| 1895 --- | 979,695   | 73,817    |
| 1896 --- | 953,734   | 812,800   |
| 1897 --- | 1,327,011 | 1,327,011 |
| 1898 --- | 1,462,871 | 1,462,871 |
| 1899 --- | 1,409,356 | 1,409,356 |
| 1900 --- | 1,722,887 | 1,722,887 |
| 1901 --- | 2,304,432 | 1,062,038 |
| 1902 --- | 2,198,496 | 1,075,868 |
| 1903 --- | 1,960,604 | 1,294,866 |
| 1904 --- | 2,190,000 | 1,289,910 |
|          | <hr/>     | <hr/>     |

16,984,736 \$12,807,489

#### ORANGE COUNTY.

| Year.    | Barrels.  | Value.    |
|----------|-----------|-----------|
| 1897 --- | 11,000    | \$12,000  |
| 1898 --- | 60,000    | 60,000    |
| 1899 --- | 108,077   | 108,077   |
| 1900 --- | 254,397   | 54,397    |
| 1901 --- | 302,652   | 181,591   |
| 1902 --- | 1,103,793 | 824,492   |
| 1903 --- | 1,355,104 | 1,016,285 |
| 1904 --- | 1,470,000 | 1,144,542 |
|          | <hr/>     | <hr/>     |

4,666,023 \$3,601,384

#### SANTA BARBARA COUNTY.

| Year.    | Barrels. | Value.  |
|----------|----------|---------|
| 1894 --- | 1,800    | \$1,800 |
| 1895 --- | 16,904   | 12,678  |
| 1896 --- | 39,792   | 35,813  |
| 1897 --- | 130,136  | 130,136 |
| 1898 --- | 132,217  | 112,549 |
| 1899 --- | 208,370  | 191,288 |
| 1900 --- | 183,486  | 165,138 |
| 1901 --- | 203,616  | 113,385 |
| 1902 --- | 230,440  | 181,313 |
| 1903 --- | 262,226  | 149,640 |
| 1904 --- | 790,000  | 445,560 |
|          | <hr/>    | <hr/>   |

2,198,987 \$1,539,300

#### SANTA CLARA COUNTY.

| Year.    | Barrels. | Value.  |
|----------|----------|---------|
| 1894 --- | 3,500    | \$3,500 |
| 1895 --- | 4,000    | 10,000  |
| 1896 --- | 900      | 1,145   |
| 1897 --- | 4,000    | 10,000  |
| 1898 --- | 3,000    | 6,000   |
| 1899 --- | 1,500    | 3,000   |
| 1900 --- | -----    | -----   |
| 1901 --- | -----    | -----   |
| 1902 --- | -----    | -----   |
| 1903 --- | 4,695    | 3,966   |
| 1904 --- | 42,000   | 13,860  |
|          | <hr/>    | <hr/>   |

63,595 \$56,471

# SAN MATEO COUNTY.

| Year.    | Barrels.    | Value.        |
|----------|-------------|---------------|
| 1896 ... | 1,000       | \$1,250       |
| 1904 ... | 3,000       | 6,000         |
|          | <hr/> 4,000 | <hr/> \$7,250 |

# UNAPPORTIONED.

| Year.    | Barrels. | Value.    |
|----------|----------|-----------|
| 1900 ... | 248,945  | \$236,498 |

# VENTURA COUNTY.

| Year.    | Barrels. | Value.    |
|----------|----------|-----------|
| 1894 ... | 290,913  | \$367,822 |
| 1895 ... | 244,624  | 244,624   |
| 1896 ... | 248,000  | 272,800   |
| 1897 ... | 368,282  | 368,282   |
| 1898 ... | 427,000  | 571,000   |
| 1899 ... | 496,200  | 496,200   |
| 1900 ... | 443,000  | 398,700   |
| 1901 ... | 472,057  | 236,028   |
| 1902 ... | 475,000  | 455,000   |
| 1903 ... | 542,902  | 517,611   |
| 1904 ... | 518,000  | 465,682   |

4,525,978 \$4,393,749

# TOTAL PRODUCTION OF PETROLEUM IN CALIFORNIA.

| Year.                 | Barrels. | Year.    | Barrels.         |
|-----------------------|----------|----------|------------------|
| All prior to 1876 ... | 175,000  | 1892 ... | 385,049          |
| 1876 ...              | 12,000   | 1893 ... | 470,179          |
| 1877 ...              | 13,000   | 1894 ... | 783,078          |
| 1878 ...              | 15,227   | 1895 ... | 1,245,339        |
| 1879 ...              | 19,858   | 1896 ... | 1,257,780        |
| 1880 ...              | 40,552   | 1897 ... | 1,911,569        |
| 1881 ...              | 128,636  | 1898 ... | 2,249,088        |
| 1883 ...              | 142,857  | 1899 ... | 2,677,875        |
| 1884 ...              | 262,000  | 1900 ... | 4,319,950        |
| 1885 ...              | 325,000  | 1901 ... | 7,710,315        |
| 1886 ...              | 377,145  | 1902 ... | 14,356,910       |
| 1887 ...              | 678,572  | 1903 ... | 24,340,839       |
| 1888 ...              | 990,333  | 1904 ... | 29,736,003       |
| 1889 ...              | 303,220  |          |                  |
| 1890 ...              | 307,360  |          | <hr/> 95,558,334 |
| 1891 ...              | 323,600  |          |                  |

# TOTAL FOR LAST ELEVEN YEARS.

| Year.    | Value.             |
|----------|--------------------|
| 1894 ... | \$1,064,521        |
| 1895 ... | 1,000,235          |
| 1896 ... | 1,180,793          |
| 1897 ... | 1,918,269          |
| 1898 ... | 2,376,420          |
| 1899 ... | 2,660,793          |
| 1900 ... | 4,152,928          |
| 1901 ... | 2,961,102          |
| 1902 ... | 4,692,189          |
| 1903 ... | 7,313,271          |
| 1904 ... | 8,317,809          |
|          | <hr/> \$37,638,330 |



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**ADVERTISING.**  
 Cooper, F. J., Advertising  
 Agency  
 Well, William M.  
**AMMUNITION.**  
 Union Metallic Cartridge Co.  
**ARCHITECTS.**  
 Howard, John Galen  
 Meyer & O'Brien  
 Reid Bros.  
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**ASSAYERS AND SMELTERS.**  
 Selby Smelting Co.  
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 Crothers, George E.  
 Deamer & Stetson  
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 Felgenbaum, Sanford  
 Noyes, Bartholomew  
 Pippy, Geo. H.  
 Sullivan & Sullivan  
 F. S. Stratton  
 Treat, R. S.

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 Bank of California  
 California Safe Deposit and  
 Trust Co.  
 Central Trust Co.  
 Crocker-Woolworth National  
 Bank  
 French-American Bank  
 Germania Savings and Loan  
 Society  
 Germania National Bank  
 Hibernia Savings and Loan  
 Society  
 Humboldt Savings Bank  
 Italian-American Bank  
 London, Paris and American  
 Bank  
 Market Street Bank  
 Mercantile Trust Co. of San  
 Francisco  
 Mechanics' Savings Bank  
 Pacific States Savings, Loan  
 and Building Co.  
 Rollins, E. H., & Sons  
 Savings and Loan Society  
 Security Savings Bank  
 Wells-Fargo-Nevada National  
 Bank

Bishop, Charles R. (Bank of  
 California.)  
**BARBER SUPPLIES.**  
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 Keystone Boiler Works  
**BOOKS AND STATIONERY.**  
 Crocker, H. S. Co.  
 Cunningham, Curtis & Welch  
 Elder, Paul & Co.  
 McVett, Kahn & Co.  
 Payot, Upham & Co.  
 Sanborn, Vail & Co.  
 San Francisco News Co.  
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 Protective Assn.  
**BROKERS.**

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 Toplits, Jos. B.  
 Wilson, J. C.  
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 California Fruit Cannery  
 Association  
 Code-Portwood Canning Co.  
 Hunt Bros. & Co.  
 Jacobs, Isidor (California Can-  
 neries)  
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 Burnett G. C.  
 Coleman, Robert L.  
 Durphy, B. F.  
 Giselman, William  
 Harvey, J. Downey  
 Hopkins, E. W.  
 Lachman, Henry  
 Lewis, Sol

Mackay, Clarence  
 Marry, George F. Jr.  
 Meyer, Daniel  
 Pacific Improvement Co.  
 Phelan, James D.  
 Quinn, John E.  
 Spreckels, Claus  
 Thompson, R. B.  
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 UPHOLSTERY GOODS.**  
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**CARPETS, UPHOLSTERY  
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 Sloane & Co.)  
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 Schilling, A. & Co.  
 Thierbach, Chas. F. & Co.  
**COMMISSION & MANUFAC-  
 TURERS' AGENTS.**

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 Clarke, Sidney A.  
 Mailliard & Schmiedell  
 Morgan & Allen  
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 Rolofson, A. C. Co.  
 Thelen, Jos. & Co.  
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 Horst, E. Clemens Co.  
 Witzel & Baker  
**CONFECTIONERS.**

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 De Martini Supply Co., The L.  
 Haas, Geo. & Son  
**CONTRACTORS.**  
 City Street Improvement Co.  
**COOPERAGE.**  
 California Barrel Co.  
 Richards, J. W.  
 Woerner Cooperage Co., David  
**CORDAGE.**  
 Tubbs Cordage Co.

**CORNICE WORKS.**  
 Forreder Cornice Works.  
**CROCKERY AND GLASSWARE**  
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 De Laval Dairy Supply Co.  
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 Dairymen's Union of Cal.  
 Haight, Fred. F. & Co.  
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 Emporium

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 lamation Co.

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 Phoenix Packing Co.  
 Rosenberg Bros. & Co.

**DRY GOODS.**  
 City of Paris Dry Goods Co.  
 Davis, R. D. & Co.  
 Hale Bros.  
 Murphy-Grant Co.  
 Newman & Levinson  
 Weill, Raphael Co. (Inc.)  
 Straus, Levi & Co.  
 Straus & Frohman  
 Weinstein, Lubin & Co.  
**DYEING AND CLEANING.**  
 Hickman, Henry

Thomas, F., Dye and Cleaning  
 Works  
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 Ham, Charles H.  
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 STRUCTION COMPANY.**  
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 Construction Co.  
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 Gets Bros.  
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 Transcontinental Freight Co.  
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 Fuller, Geo. H., Desk Co.  
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**GAS AND ELECTRIC OIL.**  
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 tric Co.

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 Union Gas Engine Co.

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 Gas Consumers' Association  
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 New Russ House  
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 Helichieu

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 Forbes, Stanley (Mutual Life)  
 Hartford Fire Insurance Co.  
 National Fire Insurance Co.  
 Pacific Mutual Life Insurance  
 of California  
 Royal and Quaca Insurance  
 Co.  
 The Liverpool, London and  
 Globe Insurance Co.  
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 Meese & Gottfried Co.  
 Merrill's Mill Co.  
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 Neustadter Bros.  
 Roos Bros.  
**METAL WORKS.**  
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 Selby Smelting Works  
**METER COMPANY.**  
 Pacific Meter Co.  
**MILLERS.**  
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 Morgan Oyster Co.  
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 Roth, Blum & Co.  
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 California Fruit Cannery Association  
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**POWDER MANUFACTURERS**  
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 California Northwestern Railroad  
**REAL ESTATE AND LANDS.**  
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 Hooker & Lent  
 Lyon & Hoag  
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 Wankowski, W.  
 Whitney, J. Parker  
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 Gorham Rubber Co.  
 Winslow, C. R. & Co.  
**RUBBER STAMPS, ETC.**  
 Patrick & Co.  
**SAFES AND VAULTS.**  
 Herring-Hall-Marvin Safe Co.  
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 Golden Gate Salt Works  
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 Pacific Coast Syrup Co.  
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 Nordwell, O. W.  
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 Tacoma Mill Co.  
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 Martin, E. & Co.  
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